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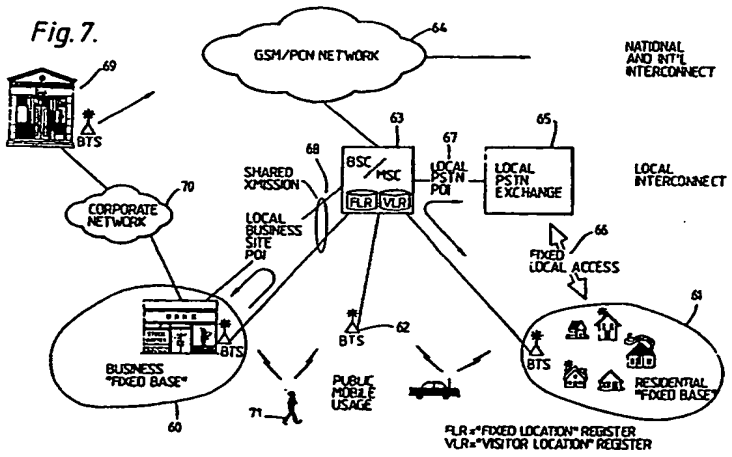
(54) Mobile communications.

(57) A mobile communications network comprises a PCN network (60-64) including a plurality of radio cells under the jurisdiction of an MSC (mobile-services switching centre). One or more of said cells comprise a fixed base (60, 61) for a mobile subscriber (71). Location information regarding the fixed bases being stored in a fixed location register (FLR). When the mobile subscriber roams into such a fixed base location (60, 61) a respective service type is provided. In particular, the fixed base may be a business site (60) with a PABX network. When the mobile subscriber roams into the business site, calls involving him are routed via the PCN network or rather the base station controller (BSC) thereof, which is intelligent in that it has MSC functionality located thereat. Thus a mobile phone can act as a desk phone, with all the same services provided, whilst the mobile subscriber is within the business fixed base.

Fig. 7.



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This invention relates to mobile communications and in particular to extension of a communications network having mobile subscribers, especially a PCN (Personal Communication Network), network to a PABX (Private Automatic Branch Exchange).

In Europe there are currently a number of different mobile communications standards which are incompatible with one another so that a mobile terminal designed for one system cannot be used with another. The Groupe Speciale Mobile (GSM) was set up in order to develop a single cellular standard for Europe. A GSM system network basically comprises a base-station system (BSS) which includes a base-station controller (BSC) and one or more base-station transceiver stations (BTS), a mobile-services switching centre (MSC), a home location register (HLR) and a visitors location register (VLR). Every subscriber (mobile station MS) is allocated to a home network, and possibly an MSC within that network, this being achieved by making an entry in the HLR. Whenever a mobile is switched on and at regular intervals thereafter, it will register with the system and give its location area (group of cells). If the mobile is not in its home area, the subscriber's data will be added to the visitor location register of the then local MSC. In the GSM system the MSC attends to the routing of a call to its destination, each MSC being connected to other MSCs, having interfaces for connection to PSTNs (Public Switched Telephone Networks such as BT or Mercury) and other services providers, and network management etc. functions.

Personal Communication Networks (PCN) now being developed in the UK are based on GSM standards but will operate at 1.8GHz rather than the 900 MHz of the basic GSM standards. The PCN systems arose as a result of the UK Government's Department of Trade and Industry "Phone on the Move" document which was basically aimed at improvement to current mobile communications (cellular radio telephones). The latter are analogue and restricted in capacity due to the limited band of wavelengths currently available. As a result of the UK Government freeing a higher wavelength band, nominally 2GHz, and the use of digital techniques, improved communications can be obtained. PCNs will not however be restricted to such mobile communications, but rather are intended to support communications to and from any standard radio or fixed telecommunication network and hence to provide a single communications network with a universal personal communicator, i.e. a truly personal portable telephone which permits communication at all times. Since the PCNs proposed are based on GSM standards they can include similar components to the GSM networks referred to above, or may include variants which are compatible with both GSM and PCN networks.

According to one aspect of the present invention there is provided a mobile communications network including a PCN network and a PABX coupled to the PCN network whereby calls involving mobile subscribers associated with the PABX are routed via the PCN network.

According to another aspect of the present invention there is provided a mobile communications network comprising a PCN network including a plurality of radio cells under the jurisdiction of an MSC, wherein one or more of said cells comprise a first fixed base for a mobile subscriber, location information regarding said first fixed base being stored in a fixed location register, and wherein when said mobile subscriber roams into said first fixed base location a respective service type is applied.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:-

Fig 1 illustrates the basic concept of a PCN cordless PABX arrangement of the present invention;

Fig 2 illustrates call set-up routes for a number of different cases;

Fig 3 illustrates a specific example of a PCN cordless PABX arrangement in greater detail;

Fig 4 illustrates an example of a PCN cordless PABX numbering scheme;

Figs 5-7 illustrate examples of PCN cordless PABX call management.

In our co-pending GB Application No 9013598.9 (Serial No) (R H Mauger 2) the contents of which is incorporated herein by reference, there is described a PCN network in which local calls from a PCN mobile subscriber are directed straight to a PSTN local exchange from the BSC over a link using CCITT Q931 or national variant DASS 2 or CCITT No 7 NUP signalling, rather than being connected to the PSTN via an MSC, as is more usual for GSM type systems. This is achieved by means of a so-called intelligent BSC which is such as to recognise that a local call is involved and to route it appropriately. The intelligent BSC incorporates the basic GSM BSC function, a local MSC function and a slave location register. A transcoder is needed in the link to the PSTN local exchange (LE). The basic premise behind the operation of the intelligent BSC is that all normal MSC to MS, and vice versa, signalling passes through the intelligent BSC and that, by monitoring the messages that pass through it, the intelligent BSC is able to slave its location register off the main network location registers, without the latter being aware that this is being done, and by means of the local MSC function it is able to identify calls from the MS that are local ones and

terminate them into the local PSTN exchange. Thus local calls can be charged at a local rate i.e. tariffing of calls between a mobile and a fixed network telephone can be tailored to the mobile's physical location. This approach has been extended and varied by the interconnect strategy described in our co-pending GB Application No 9013596.3 (Serial No) (R H Mauger 3) the contents of which are also incorporated herein by reference. It is a particular feature of the intelligent BSC that it preserves the A and A bis interfaces of the GSM based PCN network between which it is disposed whilst providing this local call handling facility.

The present invention also employs the intelligent BSC but in this case links it to a PABX disposed, for example on a corporate site. Fig 1 illustrates a basic PCN cordless PABX concept. The intelligent BSC 1 is coupled to a PCN BTS 2 in the usual manner and also to other PCN elements which are indicated only schematically at 3. A PABX 4 on a corporate site 5 is coupled to a PSTN local exchange LE 6 and also to other PSTN elements which are indicated only schematically at 7. A link 8 for local calls between the intelligent BSC 1 and the local exchange 6 employing CCITT Q931 or national variant DASS 2 or CCITT No 7 NUP signalling as in GB Application No 9013598.9 (R H Mauger 2) is indicated. There is a DPNSS (Digital Private Network Signalling System No 1) link 9 between the intelligent BSC1 and the PABX 4. The BTS is able to communicate with mobile subscribers 10 within its range in the usual manner but, as illustrated. is also able to communicate with mobile subscriber 11 within the corporate site 5 by means of a transceiver TRX 12 coupled thereto by link 13 and disposed within corporate site 5. The separate transceiver TRX 12 may not be required if the corporate site is sufficiently covered by the BTS itself.

By means of the arrangement shown in Fig 1 it is provided that a subscriber to the PABX at the corporate site and wanting to contact a PABX mobile subscriber 11 simply dials a normal 3 or 4 digit extension number assigned to the mobile. The PABX will recognise this as a mobile subscriber number and route the information to BSC 1 over link 9. Then through the normal PCN process a call will be established to the mobile if he can be found via, as illustrated BTS 2 and TRX 12 for on-site calls. If the mobile cannot be found on site, processing can continue using normal PCN techniques to actually find it elsewhere or alternatively it might be the case that the mobile is off-site and it is not necessary to look elsewhere. There are clearly many possible options if the mobile is off site, only two of which are mentioned here.

The PABX can have the equivalent of a DDI identity so that if a mobile calls in from the PCN it can call a particular PABX.

Fig 2 illustrates the same basic arrangement as Fig 1 but in a more schematic form and basically shows the routes by which calls are set-up from a mobile on-site subscriber. The transceiver TRX 12 is here shown as a MICRO BTS which is what it effectively is, and an MSC of the PCN and a link from it to the PSTN 7 is also shown.

Whenever the on-site mobile subscriber goes the equivalent of off-hook, then this information is automatically routed via the Micro BTS and the BTS to the intelligent BSC. This is indicated by (1) on the various links involved. There are a number of options, for example:

(a) for calls between mobiles on site, the routing will be to the BSC and back again (route (1)), with (I) indicating an incoming call from the BSC;

(b) for a call between a mobile on site and a PABX subscriber (PABX Sub), routing (1) to the BSC as before and the BSC recognises this call as to a PABX subscriber and routes it over route (2) to the PABX and thence to the PABX subscriber;

(c) for a call between a mobile on site and a local PSTN subscriber (sub), routing (1) to the intelligent BSC as before and thence directly to the local exchange LE and the local PSTN subscriber over route (3).

(d) for a call between a mobile on site and a local PCN subscriber (sub), routing (1) to the BSC as before then back to the BTS and to the local PCN subscriber over route (4);

(e) for a call between a mobile on site and a distant PCN subscriber, routing (1) to the BSC as before then to the PCN in general via the MSC over route (5);

(f) for a call between a PABX subscriber (on site) and a distant PCN subscriber the routing will be to the PABX to the BSC and thence to the PCN in general via the MSC i.e. route (6);

(g) for a call from a mobile on site to a trunk PSTN the routing is first to the BSC as usual over route (1) and then either to the PABX, the LE and the PSTN over route (7) or to the MSC and then to the PSTN over route (7').

Routing of incoming calls to a mobile on site will be similar. In this case the incoming call must first be routed to the BSC and thence to the MS on site, (I) indicating the BSC to MS incoming calls as before. The various options include PABX sub to MS on site; PSTN (local or otherwise) subscriber to MS on site; local PCN sub to MS on site; and distant PCN subscriber to MS on site. There is also the case of a distant PCN subscriber to a PABX sub and this will also be via the BSC.

Fig 3 shows an example of an implementation

of the PCN cordless PABX of Fig 1, which latter is particularly schematic. Links 9 and 13 of Fig 1 are drawn close together over part of their lengths and are actually provided by a single link in Fig 3, a microwave link 20 as drawn. The intelligent BSC 21 has a BSC core 22 and a transcoder 23 to get out to the local exchange LE 24. Otherwise 16kbit/s working is envisaged as normal. The connection 25 from the PABX 26 is like that of the LE 24 at 64 kbit/s and thus a further transcoder 27 is required. Ignoring the transceiver TRX 28, the transcoded signal from the PABX 26 needs to be routed up to the BTS 29 and it is currently envisaged that this is via microwave link 20. The configuration capability of the BTS 29 is used to route the transcoded PABX signal, since the BTS is nearest, and it is used to take the traffic circuits on to the BSC 21 following splitting out from the other signals. If a transceiver 28 is actually disposed at the site, for example, in those cases where the BTS one is not sufficient i.e. the signal may not come into the building, it will be necessary to multiplex the TRX signals and the transcoded signal so that a single link 20 is employed and for this purpose block 30 is required, this providing grooming and multiplexing as well as a TRX interface. It may actually be necessary to provide a TRX 28 on each floor of a building. The arrangement illustrated avoids the need to put a complete BTS station at the corporate site and is thus substantially cheaper to implement. The BTS extracts the transcoded signal from the PABX and applies it to the rest of the PCN system as illustrated.

In order to achieve all of the various possibilities of interconnection with PABX subscribers, mobile or otherwise, a suitable numbering scheme must be chosen. An example of a PCN number with an associated corporate net number and a national number with DDI is indicated in Fig 4. This drawing actually envisages a case not described previously but which is likely to be encountered in practice, i.e. where a business has several corporate sites and mobiles are required to be contactable irrespective of which site they are on at the time. There are, in the example shown in Fig 4, two corporate sites PABX 40 and PABX 41 which are linked by a DPNSS line 42. Thus the functionality of the PABX Fig 3 is now split between the sites. The two PABXs thus appear to be a single one. At both ends of the system there is a local interconnect 45, 46 to the respective BTSs 43, 44. The PABXs 40, 41 are connected to respective BSCs 47, 48 via respective DPNSS links and to the PSTNs network 49, 50 via DASS2 links. The PCN network additionally includes MSCs 51 and 52. It is intended that a PABX mobile subscriber which is normally associated with PABX 42, for example, can move to the site associated with PABX 41 and still be found for calls coming from the PABX or the BT network since if BSC 48 cannot find him, the normal PCN search process will be followed treating his as a normal PCN subscriber and BSC 47 will find him instead in this example. Similarly the PSTN will be able to reach the PABX mobile subscribers since they will have dialled a corporate PSTN number.

Fig. 4 illustrates an example of PCN numbering scheme for this application, i.e. a business user. It includes a PCN code (01), a PCN operator discriminator (X), a four digit BSC code (YYYY) the first digit of which may be 0 indicating a simple personal subscriber or 1-9 indicating a corporate subscriber, and the three subsequent digits defining a BSC (home base), and a four digit code (ZZZZ) the first digit of which, when taken with the first digit of the previous four digit code, defines a corporate account in the BSC and the last three digits of which defines a corporate subscriber in the BSC, the whole of these four digits taken together defines a personal subscriber in the BSC. The corporate net number comprises a three digit (AAA) code defining corporate locations and a four digit (BZZZ) code, the last three digits of which define the corporate subscriber in the BSC i.e. from the PCN number. The B can distinguish between different sites e.g. be 3 for the PABX 41 site or 5 for the PABX 40 site. The national number with DDI of a mobile corporate subscriber is 0 (NNG)BZZZ (NNG is the national numbering group code).

For such corporate mobile subscribers a roaming requirement is a possibility. Thus a call established while the mobile is on the site associated with PABX 41 can be continued via the PCN network as the mobile roams and if it subsequently arrives at another corporate site such as that associated with PABX 40 the call can still be continued although the mobile will effectively become a local caller again.

The corporate identity BZZZ whilst being general will actually associate with a particular PABX. Thus if 3076 is dialled at the site associated with PABX 41, the search for the MS will be local, but if 5076 is dialled at PABX 41 the search for the MS will be at the site associated with PABX 40. The PABXs can do that basic routing via link 42, and connected to the appropriate site, break out and search for the mobile can be carried out.

As referred to in Application No 9013598.9 (R H Mauger 2) other radio standards e.g. CT2, DECT can also be accommodated, the intelligent BSC being used to provide the requisite standards conversion. Fig 5 shows an arrangement similar to Fig 15 of that application in which a PABX can be billed as well, instead of different PCN operators of that Fig 15.

Fig 6 illustrates an example of PCN cordless PABX call management, in particular, extension of calls over the PCN on roaming and uses the same reference numbers as Fig 4. A subscriber to the PSTN network 49 calls a corporate mobile using the national number (DDI No, 0(NNG)BZZZ). The PABX strips the front part of the code off and sends BZZZ, the subscriber corporate number, and possibly an indication of who the call is from to the BSC 47 which translates it into the appropriate TMSI/IMSI for the PCN network to actually locate the called subscriber, the calling ID is also translated, and the call proceeds through MSCs 51 and 52, BSC 48 and BTS 44. At the far end, if the handset has a calling number identification display the PABX 40 will be identified but not who on it was calling.

In the arrangements so far described the linking of a corporate network involving a PABX with a PCN network has been considered. However further advantages flow from extensions of this, as will be described hereinafter, particularly in terms of call cost.

In order for mobile communications systems to be successful, the call cost must be affordable although the call costs associated with a corporate (business) community of interest may be different to those of a personal (residential) community of interest. For example, salesmen with traditional cellular car phones may roam over the whole of a large area, such as the United Kingdom, and their calling pattern may be different depending on where they are located at any time. In a PCN concept, many subscribers will be of the family type (residential rather than business) and a much smaller area of coverage will generally be involved. Certain small businesses, such as estate agents, for example, will also generally require relatively small coverage areas. When a call is made between a subscriber to a PSTN and a mobile which is local to that subscriber, the call costs are expected by the caller to be less than when the mobile is further away. As discussed in Application No 9013598.9 (R H Mauger 2), in the basic GSM arrangement a call made by a mobile station to a fixed telephone connected to a PSTN has to be processed through the relevant BTS, BSC and MSC to the PSTN, even if the fixed telephone is actually local to the mobile station or rather the BSC. The charges incurred in making such calls will thus be high, since transmission to the MSC, which may be a considerable distance away from the BSC, will be over fixed lines which are expensive to provide or rent. Thus Application No 9013598.9 proposes the use of an intelligent BSC which is such as to recognise that a local call is involved and to route it appropriately.

Now, a business community of interest may be a UK business site, with its own PABX, of a world-wide corporation that already has a corporate network which allows very cost efficient calls to be made between sites world-wide. If the PCN network is coupled to such a corporate network the possibility arises of being able to use the corporate network with its associated "low cost" calls. Furthermore a residential community of interest can also be coupled in, so that a person employed by such a corporation and living in a particular residential community of interest can have a single mobile telephone and roam where he likes, the calls being billed according to his location, e.g. to the corporation when he is within the business jurisdiction and to his residence when he is in the residence jurisdiction.

A system which enables these possibilities to be achieved is illustrated in Fig. 7. The PCN system includes a BTS at a business fixed base 60 having a PABX, a BTS at a residential fixed base 61, a BTS 62 between the bases 60 and 61 for public mobile usage, an intelligent BSC 63, based on that described in Application No 9013598.9 (R H Mauger 2), and other elements indicated schematically as PCN network 64, via which national and international connections can be made, such as via BT. Connected to intelligent BSC 63 is a local exchange 65 (BT local DMSU) for local interconnections to PSTN subscribers within the residential fixed base 61 over fixed local access 66. The connection 67 between intelligent BSC 63 and local exchange 65 is termed a local PSTN POI (point of interconnect). In addition to the interconnection between intelligent BSC 63 and the BTS at the business fixed base 60 there is a local business site POI as indicated, transmission actually being shared, as indicated, over a common interconnect 68. Another business base 69 having its own BTS connected to the PCN network 64 is connected to business base 60 via a corporate network 70, which may include business bases disposed on a world-wide basis and linked on a cost-effective basis. The mobile subscriber 71 can roam where he likes within the fixed business base 60, the fixed residential base 61 and anywhere else outside of them, particularly as drawn for example therebetween and within range of BTS 62. The mobile subscriber's location thus varies and it is necessary for this location to be associated with a new functionality of the intelligent BSC 63, namely that of a Fixed Location Register (FLR) rather than a Home Location Register (HLR) as in conventional GSM/PCN arrangements, as well as that of a VLR (Visitors Location Register). The intelligent BSC 63 needs to be able to recognise whether the subscriber is at business or home (residence) and provide the appropriate services. In the case of the residence, this will mostly relate to tariffing and

billing of calls of made by the subscriber. For incoming calls to a mobile subscriber such as from a BT network, the BT network will not itself know where the mobile subscriber is, but the PCN network can find him using the location registers, generally checking the VLR's first. When the subscriber is within the business fixed base 60, it is not just a tariffing situation that pertains, although calls to fixed extensions or other mobiles within the building/site will be directed by the BSC 63 back to the PABX, as described with reference to Figs. 1 to 3 for example, without involving outside agencies, such as BT, and thus with full control of the tariff.

As will be appreciated, the intelligent BSC is a BSC with some of the MSC's functionality disposed thereat rather than all being separated. Thus some of the MSC's functionality is located at a BSC in proximity to the interconnect points. In particular this functionality is a switching functionality such as may be provided by our DMS (Digital Multiplex System) switch, in particular a small version which can be considered to be a small MSC/intelligent BSC. The DMS switch has other functionality to switching functionality, in particular service functionality such as "least cost routing" capabilities which enables all calls to be analysed and made in the most cost effective manner. For example, assume there is an arrangement whereby the least cost routing to New York City is via the corporate network 70, then a call made by mobile subscriber 71 to New York City whilst he is within the business fixed base 61, will be recognised as such and re-routed by the intelligent BSC 63 back to the corporate network 70, rather than via the PCN network 64. Thus when the mobile subscriber 71 is within his business base his mobile telephone will behave in an identical way to a fixed one on his desk connected to the PABX. Least cost routing and tariffing are not the only services which can be provided, any services provided by a desk phone can be provided for the mobile phone whilst within the business fixed base.

Least cost routing can also be applied to calls made whilst roaming or at the residence fixed base provided suitable arrangements have been made, such as with the company owning the corporate network, and the intelligent BSC is aware of them. Then for any call, the subscriber, his present location and the arrangements applicable are considered and the call will be handled in the cheapest manner, for example, letting the PCN operator carry it themselves, letting BT connect it or passing it back to the corporate network for them to handle themselves.

In summary, the invention proposes a mobile communications network including a PCN network and a PABX coupled to the network whereby calls involving mobile subscribers associated with the PABX are routed via the PCN network. In other words a PCN or cellular phone becomes part of a PABX or private network when the subscriber roams into a related cell or cells. Single handset operation of a cordless PABX and a PCN/GSM service can be achieved with automatic discrimination of the service type depending on location. In other words a handset can take on a different service profile when roaming into a certain cell or group of cells comprising a fixed base, the network then handling his calls differently. The base may be a business base and/or a residence base with different tariff structures and possibly different services being applied. In order to achieve this, information with regard to subscribers who have "fixed" locations (business or residence) within the jurisdiction of an MSC has to be available at least at the relevant intelligent BSC as a fixed location register, and will generally also be available at a fixed location register in the MSC. Such functionality is not catered for in the GSM standard but can be employed without violating the GSM Standard and is thus considered as an enhancement thereto. Furthermore the above proposals allow a cordless PABX/cordless Centrex to be implemented within a BSC rather than an MSC thereby saving transmission and switching expenditure. Networking of a cordless PABX/cordless Centrex service with a PABX as at a corporate site provides integrated fixed/mobile corporate networking. This minimises corporate mobility costs whilst providing a full "find-me" service. Furthermore, integration of transmission for the BTS and the PABX access minimises access costs for corporate networking. Whereas the above generally refers to an intelligent BSC i.e. one which includes MSC functionality, it can alternatively be considered as putting functionality at the BSC rather than the MSC i.e. locating MSC functionality close to the service subscriber. In other words the MSC functionality is moved to where GSM typically puts the BSC rather than moving functionality into the BSC. There is thus a co-location of functionality.

Whilst the invention has been described in terms of GSM it is not to be considered so limited and is also applicable to other "PCN" communications standards/systems particularly those employing equivalent elements to the BTS, BSC and MSC of the GSM system.

Claims

1. A mobile communications network characterised by a PCN network and a PABX network coupled to the PCN network whereby calls involving mobile subscribers associated with the PABX are routed via the PCN network.

2. A network as claimed in claim 1 characterised in that calls involving said mobile subscribers (11) associated with the PABX (4) are routed via a base station controller (BSC) (1) of the PCN network which has mobile-services switching centre (MSC) functionality located thereat.

3. A network as claimed in claim 2 characterised in that when said mobile subscribers (11) roam outside of the jurisdiction of the PABX (4), calls involving them are also routed via said base station controller but different service types can be provided.

4. A network as claimed in claim 1 characterised in that the service type provided for a said mobile subscriber (11) varies automatically in dependence on the location of said mobile subscriber.

5. A network as claimed in claim 4 characterised in that the PCN network includes a BSC (63) with MSC functionality located thereat, wherein the PABX has one or more radio cells comprising a first fixed base (60) within the jurisdiction of the associated MSC and location information regarding said fixed first base is stored at said BSC (63), whereby when a said mobile subscriber (71) roams into said first fixed base location (60) it becomes part of the PABX network and a respective service type is provided.

6. A network as claimed in claim 5 characterised in that the PCN network includes one or more other radio cells comprising a second fixed base (61) within the jurisdiction of the associated MSC and location information regarding said second fixed base (61) is stored at said BSC (63) whereby when a said mobile subscriber (71) roams into said second fixed base location (61) a respective service type is provided.

7. A mobile communications network characterised by a PCN network including a plurality of radio cells under the jurisdiction of an MSC, wherein one or more of said cells comprise a first fixed base (60, 61) for a mobile subscriber (71), location information regarding said first fixed base (60, 61) being stored in a fixed location register (FLR), and wherein when said mobile subscriber roams (71) into said first fixed base location (60, 61) a respective service type is applied.

8. A mobile communications network as claimed in claim 1 or claim 7 characterised in that the PCN network includes a BSC (63) with MSC functionality located therein and wherein cordless PABX/cordless Centrex operation is implemented within the BSC.

9. A mobile communications network as claimed in claim 1 characterised in that a cordless PABX/cordless Centrex service is networked with the PABX network whereby to provide integrated fixed/mobile corporate networking.

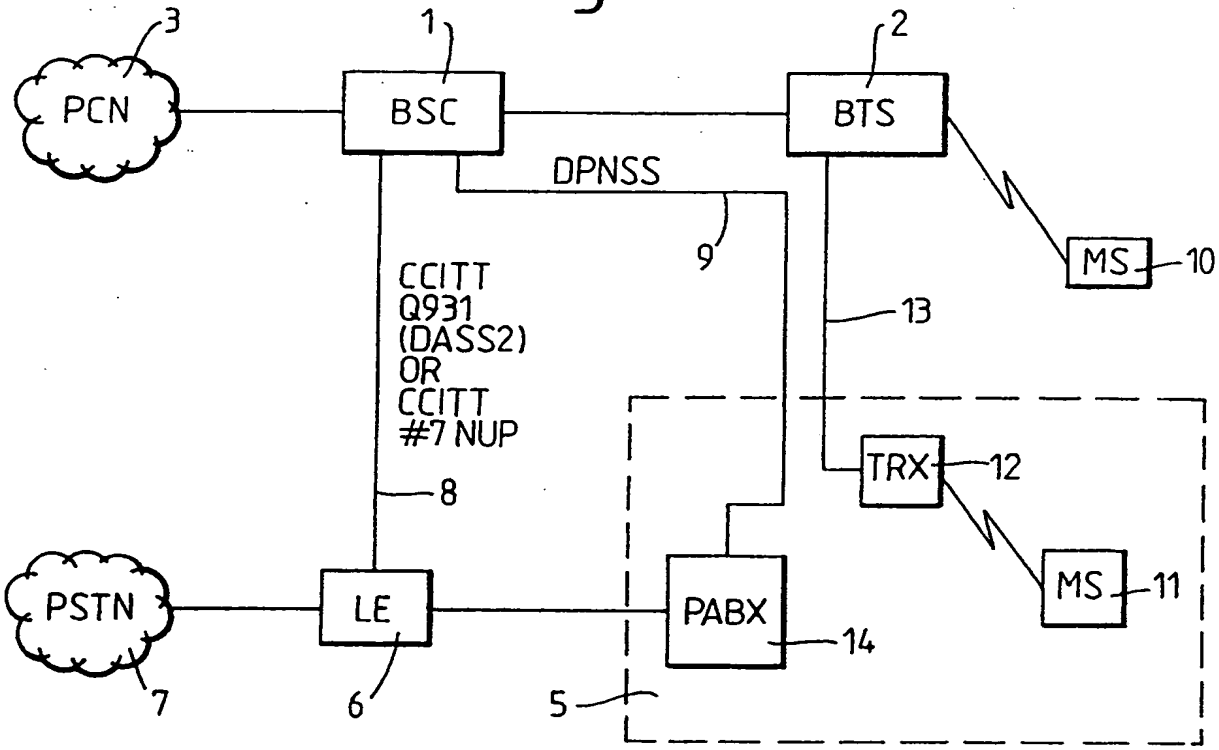
10. A mobile communications network as claimed in claim 2 characterised in that the PCN network includes a base station transceiver station BTS (2) associated with the PABX (4) and wherein transmission between the BSC (1) and the PABX (4) and the BSC and the BTS is integrated.

11. A mobile communications network as claimed in claim 5 or claim 6 characterised by including a local PSTN network (7; 65) and wherein local calls between said mobile subscribers (11; 71) associated with said BSC (1; 63) and fixed subscribers of said local PSTN are handled directly by said BSC.

12. A mobile communications network as claimed in claim 2 characterised in that the PABX forms part of a corporate network (60, 70, 69) and wherein said BSC (63) includes functionality providing a least cost routing service whereby a call from a mobile subscriber (71) can be connected via the corporate network rather than otherwise if it is cheaper and if the mobile subscriber is authorised to use said corporate network.

13. A mobile communications network as claimed in claim 1 or claim 7 characterised in that when a call involving a mobile subscriber is made the cost is billed to an account corresponding to the location of the mobile subscriber.

Fig. 1.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3
BSC
1
BTS
2
DPNSS
9
MS
10
CCITT
Q931
(DASS2)
OR
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TRX
12
MS
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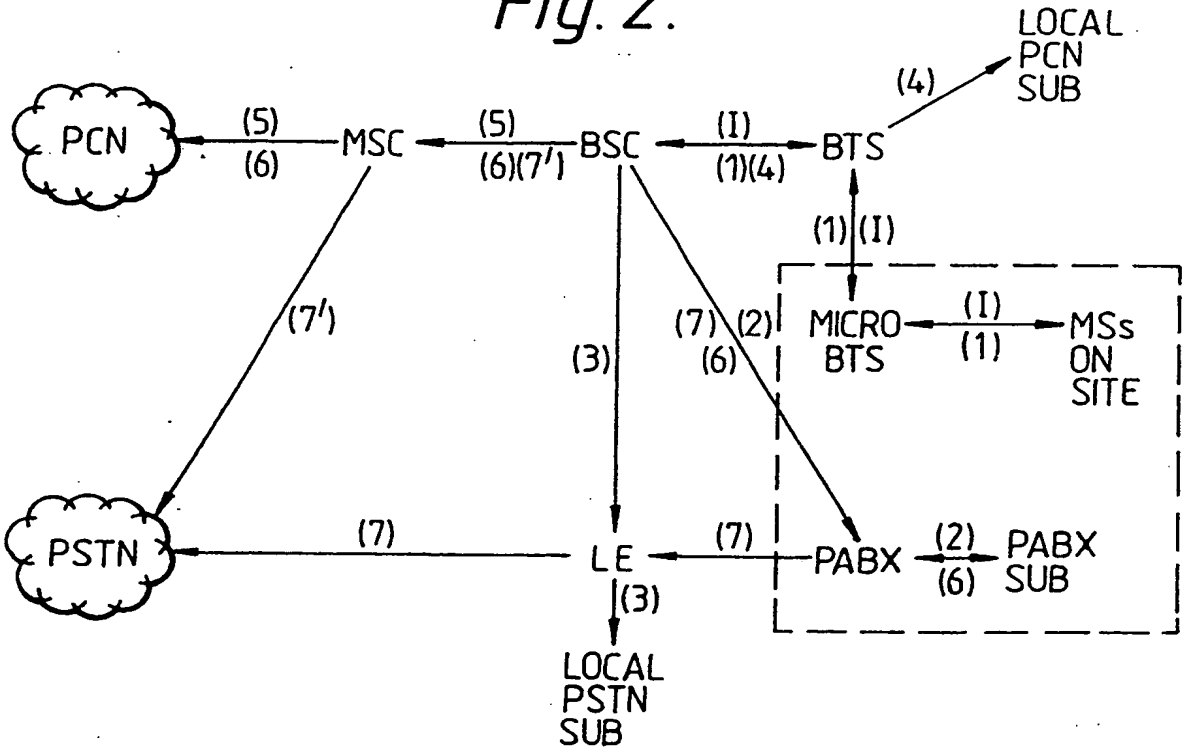
PSTN
7
LE
6
PABX
14
5

Fig. 2.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MSC
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BSC
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BTS
(4)
LOCAL
PCN
SUB
(1) (I)
(7')
(3)
(7) (2)
(6)
MICRO
BTS
(I)
(1)
MSs
ON
SITE
PSTN
(7)
LE
(7)
PABX
(2)
(6)
PABX
SUB
(3)
LOCAL
PSTN
SUB

Fig. 3.

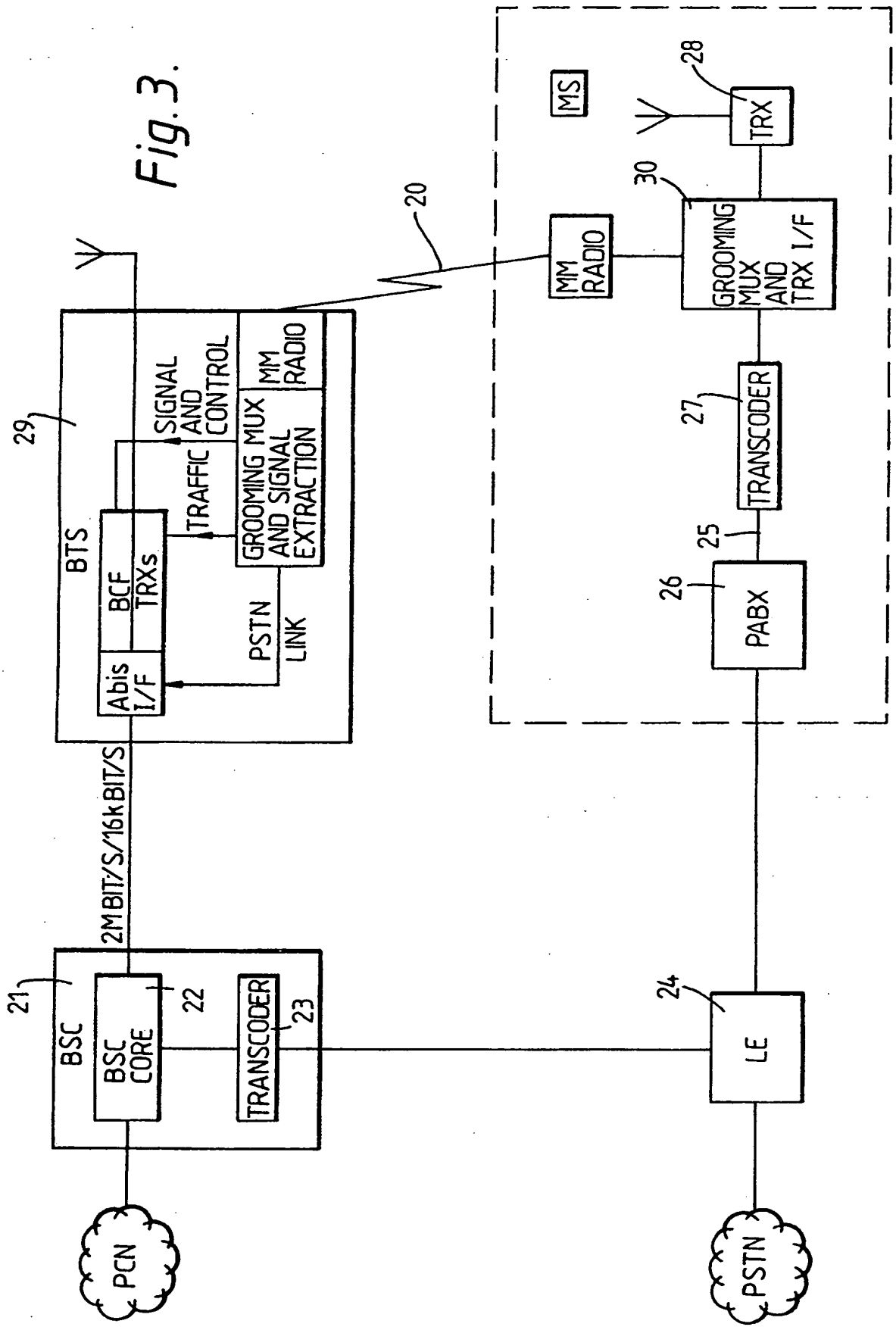

MS
28
TRX
30
GROOMING MUX AND TRX I/F
MM RADIO
20
27
TRANSCODER
25
26
PABX
24
LE
PSTN
29
BTS
SIGNAL AND CONTROL
MM RADIO
TRAFFIC
GROOMING MUX AND SIGNAL EXTRACTION
BCF
TRXs
Abis I/F
PSTN LINK
2MBIT/S/16kBIT/S
21
BSC
BSC CORE
22
TRANSCODER
23
PCN

Fig. 4.

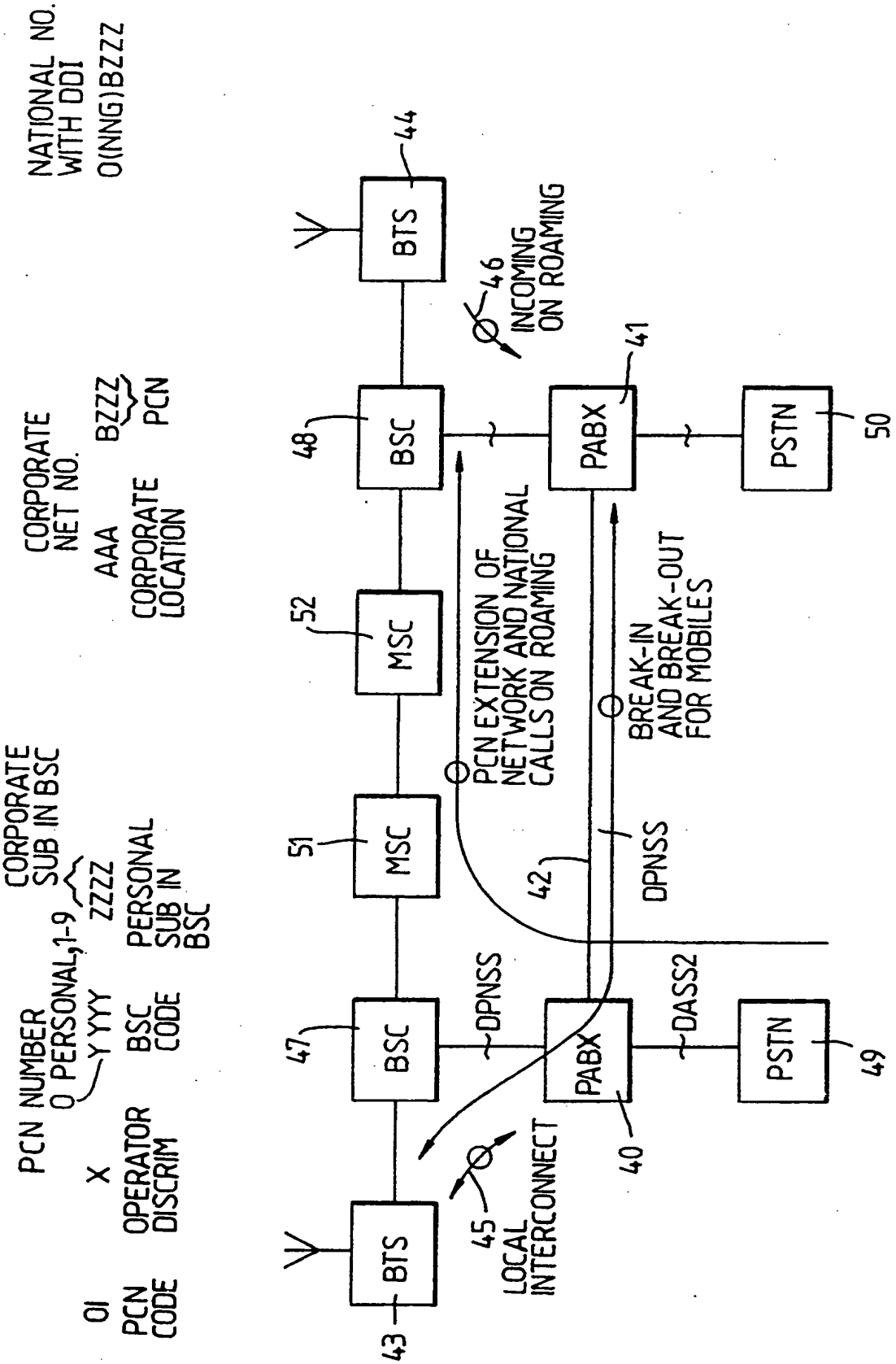
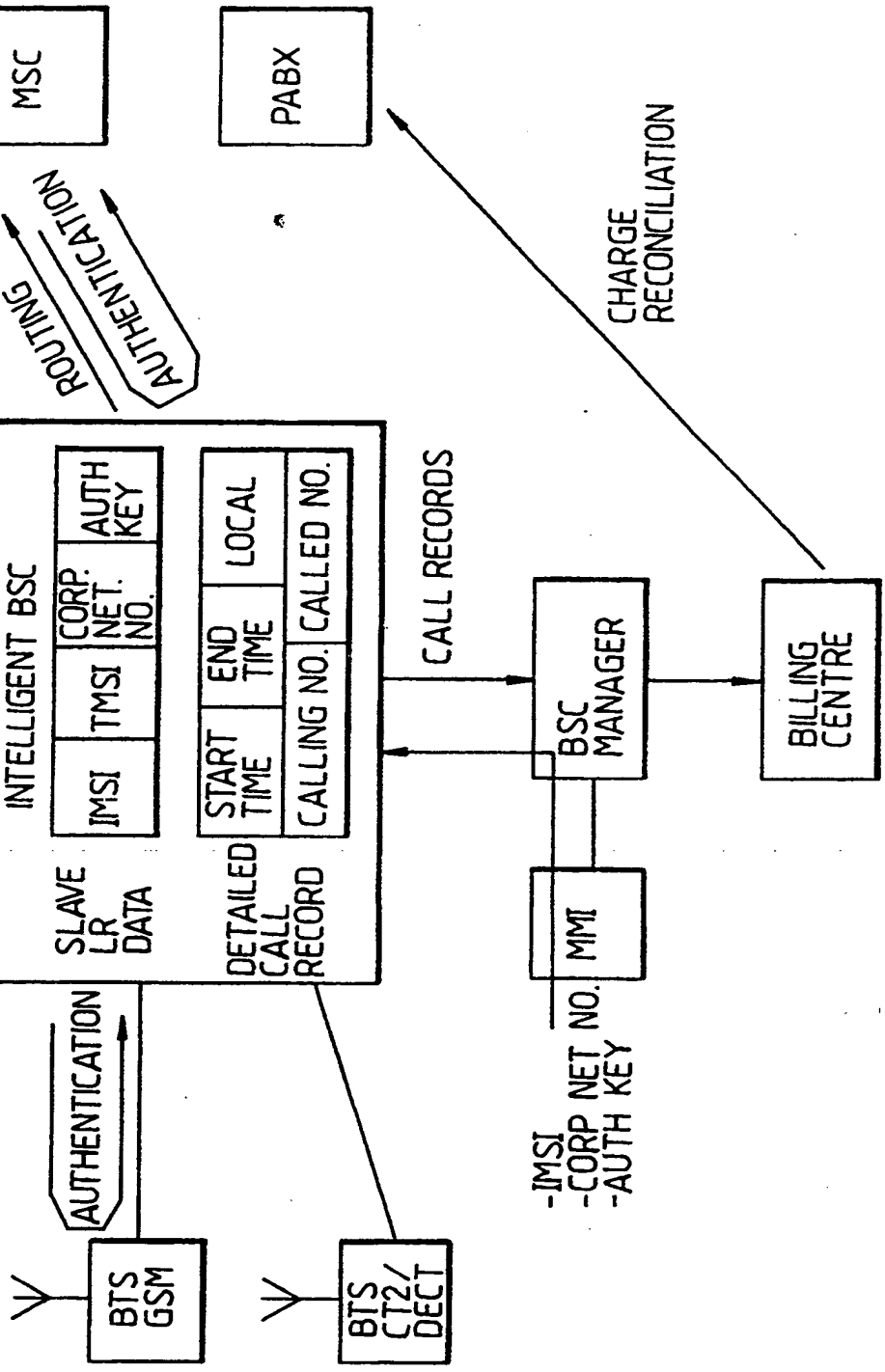

PCN NUMBER
0 PERSONAL, 1-9 ZZZZ
CORPORATE SUB IN BSC
PERSONAL SUB IN BSC
01
PCN CODE
X
OPERATOR DISCRIM
YYY
BSC CODE
CORPORATE NET NO.
AAA
CORPORATE LOCATION
BZZZ
PCN
NATIONAL NO. WITH DDI
O(NNG)BZZZ
BTS
BSC
MSC
PABX
PSTN
DPNSS
DASS2
LOCAL INTERCONNECT
PCN EXTENSION OF NETWORK AND NATIONAL CALLS ON ROAMING
BREAK-IN AND BREAK-OUT FOR MOBILES
INCOMING ON ROAMING
43
44
45
46
47
48
49
50
51
52
40
41
42

Fig. 5.


MSC
PABX
ROUTING
AUTHENTICATION
CHARGE RECONCILIATION
INTELLIGENT BSC
IMSI
TMSI
CORP. NET. NO.
AUTH KEY
SLAVE LR DATA
START TIME
END TIME
LOCAL
CALLING NO.
CALLED NO.
DETAILED CALL RECORD
CALL RECORDS
BSC MANAGER
BILLING CENTRE
MMI
-IMSI
-CORP NET NO.
-AUTH KEY
AUTHENTICATION
BTS GSM
BTS CT2/ DECT

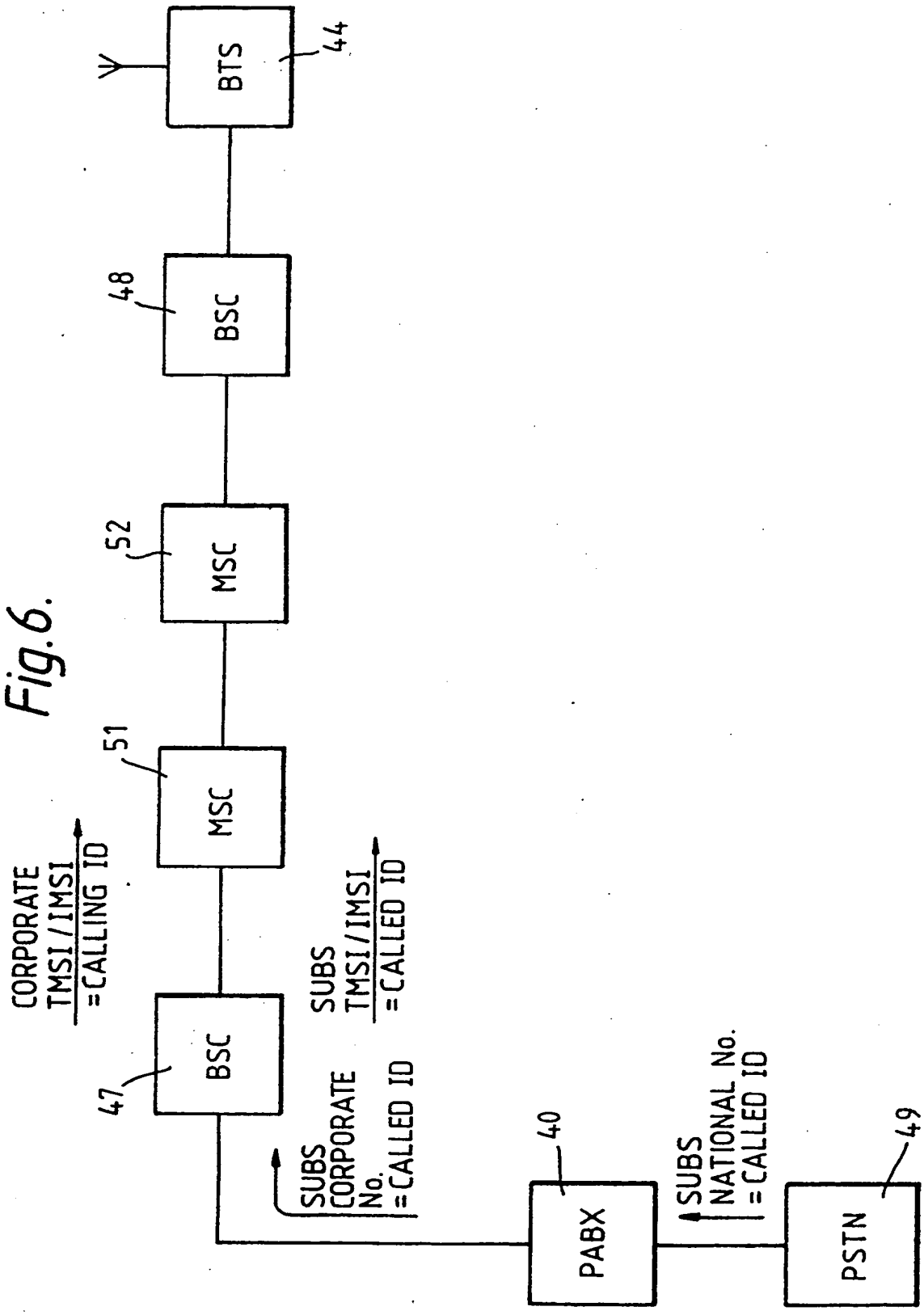

BTS
44
BSC
48
MSC
52
MSC
51
BSC
47
CORPORATE TMSI/IMSI =CALLING ID
SUBS TMSI/IMSI =CALLED ID
SUBS CORPORATE No. =CALLED ID
PABX
40
SUBS NATIONAL No. =CALLED ID
PSTN
49

Fig.6.

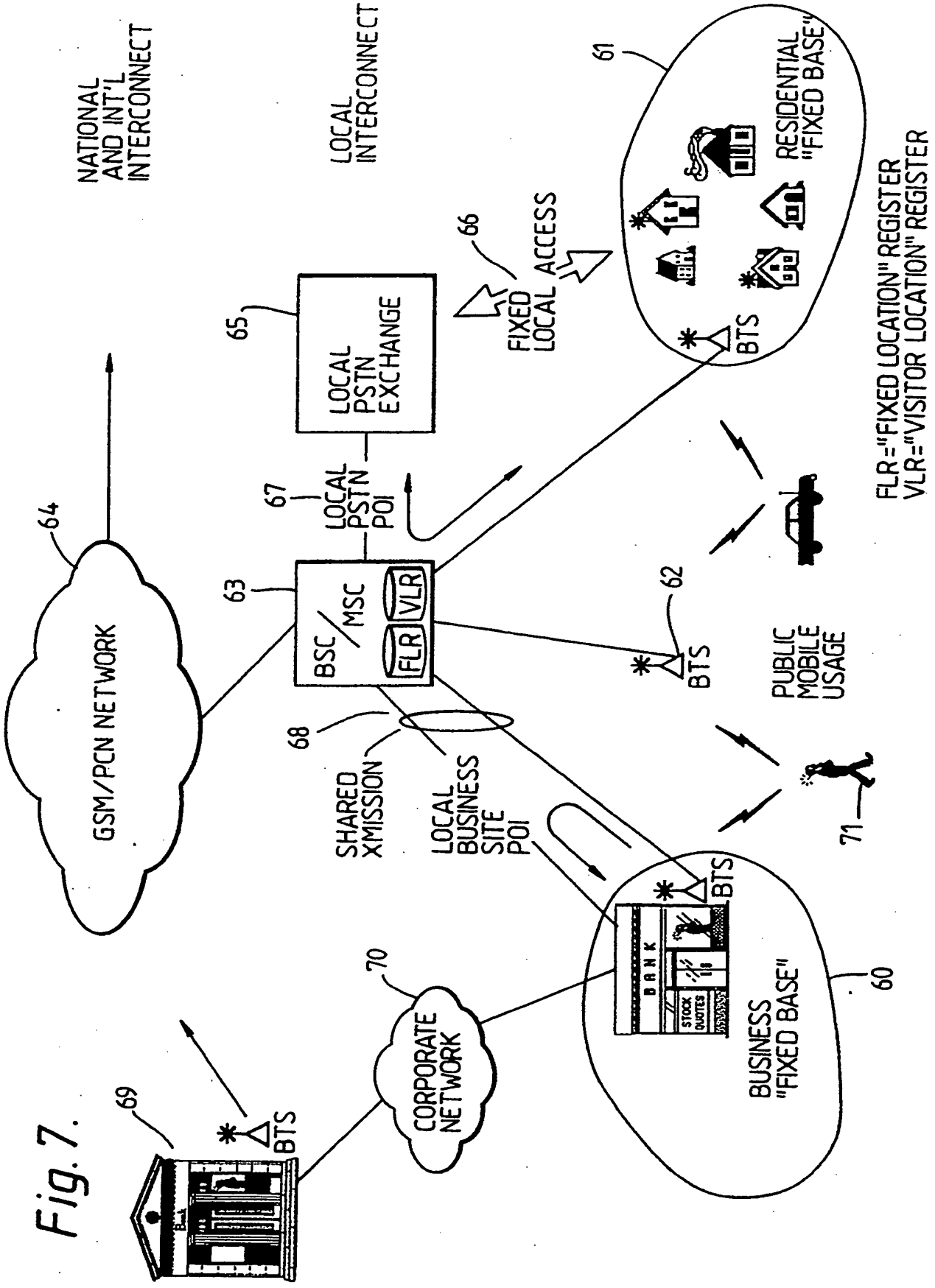

NATIONAL AND INT'L INTERCONNECT
LOCAL INTERCONNECT
61
RESIDENTIAL "FIXED BASE"
66
FIXED LOCAL ACCESS
65
LOCAL PSTN EXCHANGE
BTS
FLR="FIXED LOCATION" REGISTER
VLR="VISITOR LOCATION" REGISTER
64
GSM/PCN NETWORK
67
LOCAL PSTN POI
63
BSC/MSC
VLR
FLR
62
BTS
PUBLIC MOBILE USAGE
68
SHARED XMISSION
LOCAL BUSINESS SITE POI
71
BTS
BANK
STOCK QUOTES
BUSINESS "FIXED BASE"
60
70
CORPORATE NETWORK
69
BTS

Fig. 7.